Giving the electrets state to the samples led to a decrease in the number of particles in the filtrate by an average of 22% compared to the original samples. The deposition of solid particles on charged fibers occurs due to the attraction of neutral particles of inclusions by the forces of charged fibers due to an increase in the electrokinetic potential of the surface of nonwoven polymeric fabrics while imparting an electret state.

At the same time, the filtration time after giving the samples an electrets state increases almost 1,3 times (Fig. 1b). Electrophysical factors have a significant effect when a fluid flows through the pores of the material. A special role is assigned to the action of the electret charge. The polarization charge creates an energy barrier that affects the passage of the filtrate through polymer nonwoven webs [2]. The change in the rate of mass transfer is explained as follows. The diffusion coefficient of dielectric fluids is inversely proportional to the dynamic viscosity. Viscosity increases in the electric field. Hence, the action of the electric field leads to a decrease in the diffusion coefficient.

So, when electretising materials, the filtering time increases by 25% and the purity of the resulting filter increases by 22%.

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MAGNETIZATION REVERSAL IN GdCo ANTIDOT FILMS WITH PERPENDICULAR ANISOTROPY

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Influence of nanoscale antidot lattices on magnetization reversal processes in GdCo films with strong perpendicular anisotropy has been investigated. Lattice parameters have been set by choosing substrates prepared by anodizing aluminum foils in appropriate conditions. We have studied the influence of the nanoscale local curvature on magnetization processes by comparing flat antidot films, antidot films with curvature, and continuous films with curvature.

Recently magnetic antidot films have drawn significant attention from both fundamental and applied standpoints. In particular, the precise control over the local magnetization distribution makes antidot lattices promising candidates for magnetic memory applications and spin waves logic elements in magnonics. In this work we consider magnetization reversal processes in GdCo antidot lattice with strong out-of-plane anisotropy taking into account additional curvature features resulting from the synthesis process.

Ta/Gd-Co/Ta films were deposited onto glass (reference sample) or porous alumina substrates by magnetron sputtering. Magnetic field of 200 Oe was applied parallel to the substrate during the deposition. Anodic alumina substrates were synthesized by anodizing aluminum foils of high purity (99.997 %) at 20 ºC, constant voltage of 40 V, and 0.3 M oxalic electrolyte (pores size was 75 nm, the interpore distance was 105 nm) [1]. One part of alumina substrates was used as prepared (antidot lattice with natural surface roughness), another part was subjected to mechanical polishing (flat antidot). Also continuous barrier layer of porous alumina layer with natural well-controlled curvature was considered. Magnetization processes were analyzed using vibrating sample magnetometer and Kerr microscope. To analyze and complement the experimental results, micromagnetic modelling using OOMMF software was used.

In-plane hysteresis loops confirmed, that no in-plane anisotropy component was induced during the deposition for all samples. Out-of-plane hysteresis loop measured on the reference sample had a typical square shape with the reduced remanence close to 1.0 and the coercivity of 50 Oe. The strongest increase in coercivity (up to 700 Oe) was observed for polished antidot sample which should have minimal curvature. Hysteresis loop retained large remanence around 0.95 but showed a broad switching field distribution. Coercivity enhancement for antidot sample with natural roughness up to 300 Oe was not as strong, but the loop acquired significant slope and had remanence dropped to 0.09. Continuous film with nanoscale curvature had hysteresis loop similar to the polished antidot sample, but the coercivity was only 100 Oe. Micromagnetic modelling performed for flat antidot geometry demonstrated the increase of coercivity with up to 4 times the coercivity of the continuous film for ratio of diameter and interpore distance close to 1. The presence of the nanoscale curvature leads to the tilting of the local anisotropy axes and increases the contribution of the magnetization rotation. In conclusion, we demonstrated the importance of the nanoscale curvature for magnetization reversal and hysteresis properties of magnetic antidot lattices with strong perpendicular anisotropy. The strongest coercivity enhancement can be expected for antidot lattice with diameter/distance ratio close to 1.

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